High HIV prevalence and associated risk factors among female sex workers in Rwanda

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Abstract

Human immunodeficiency virus (HIV) prevalence is often high among female sex workers (FSWs) in sub-Saharan Africa. Understanding the dynamics of HIV infection in this key population is critical to developing appropriate prevention strategies. We aimed to describe the prevalence and associated risk factors among a sample of FSWs in Rwanda from a survey conducted in 2010. A cross-sectional biological and behavioral survey was conducted among FSWs in Rwanda. Time–location sampling was used for participant recruitment from 4 to 18 February 2010. HIV testing was done using HIV rapid diagnostic tests (RDT) as per Rwandan national guidelines at the time of the survey. Elisa tests were simultaneously done on all samples tested HIV-positive on RDT. Proportions were used for sample description; multivariable logistic regression model was performed to analyze factors associated with HIV infection. Of 1338 women included in the study, 1112 consented to HIV testing, and the overall HIV prevalence was 51.0%. Sixty percent had been engaged in sex work for less than five years and 80% were street based. In multivariable logistic regression, HIV prevalence was higher in FSWs 25 years or older (adjusted odds ratio [aOR] = 1.83, 95% [confidence interval (CI): 1.42–2.37]), FSWs with consistent condom use in the last 30 days (aOR = 1.39, [95% CI: 1.05–1.82]), and FSWs experiencing at least one STI symptom in the last 12 months (aOR = 1.74 [95% CI: 1.34–2.26]). There was an inverse relationship between HIV prevalence and comprehensive HIV knowledge (aOR = 0.65, [95% CI: 0.48–0.88]). HIV prevalence was high among a sample of FSWs in Rwanda, and successful prevention strategies should focus on HIV education, treatment of sexually transmitted infections, and proper and consistent condom use using an outreach approach.

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Declaration of conflicting interests

Keywords

Female sex workers; HIV; risk factors for HIV transmission; Rwanda

Introduction

Sex workers include female, male, and transgender adults and young people who receive money or goods in exchange for sexual services, either regularly or occasionally. [1,2] With a reported HIV prevalence up to 10- to 20-fold higher than that of the general population, female sex workers (FSWs) comprise an important sub-population in the epidemiology of HIV infection.[3,4] However, there exists a paucity of data regarding HIV prevalence among FSWs in sub-Saharan African countries and results vary widely. In 13 Central and West African countries, the HIV prevalence varied between 3.8 and 60.4%.[5,6] In Uganda, the HIV prevalence among FSWs is estimated to be 37%, more than five times higher than the Ugandan general population. [7,8] This is of critical importance because, based on estimates from 2011, 18% of incident HIV infections in the general population in Sub-Saharan Africa is attributed to female sex work.[5]

FSWs are at high risk for HIV infection due to the high number of multiple and concurrent sexual partners. The high HIV prevalence among FSWs can be related to particular physical, economic, and policy factors, as well as individual related and social factors associated with condom negotiation.[9] In general, there are policies which specifically relate to sex work including HIV prevention and treatment, human rights, and policies that criminalize sex work. Like other marginalized populations, sex workers face significant barriers to HIV prevention and treatment. The stigma associated with sex work, combined with the prosecution of sex workers and the socioeconomic and physical threats many sex workers face, contribute to these barriers. In Rwanda, sex work is illegal and this influences how FSWs access care. There are no specialized health clinics targeting this key population. Previous studies have found that HIV in FSWs is significantly associated with previous and current symptoms of sexually transmitted infections (STIs) and the duration of sex work.[10–14] FSW is an underserved population for HIV prevention, care, and treatment, and this is partially due to stigma for FSWs. Providing FSW care and treatment services, as well as other prevention methods has proven difficult, particularly in countries where sex work is not legal.[15,16]

Rwanda has a generalized HIV epidemic, with an estimated prevalence of 3% in 15- to 49-year-olds in 2010 per the Rwanda Demographic and Health Survey.[13] There were marked differences in prevalence by province, age, gender, and location, ranging from 2.8% among women in rural areas to 8.7% among women in urban areas.[13] A study conducted in Kigali, the capital of Rwanda, in 2009, reported that the prevalence of HIV among FSWs was 40.0%.[17] Another study found a prevalence of 24% between 2006 and 2007,[18,19] whereas the HIV prevalence in general population was 3.0%.[13] In Rwanda, in 2009, it was estimated that 61% of all incident HIV infections were attributed to FSW clients and the sexual partners of their clients.[17]

Despite the documented high HIV prevalence among FSW in Rwanda, considerable gaps remain in the quality and quantity of information regarding behavioral and biological risk factors in this group, which may serve to guide appropriate HIV prevention and treatment interventions. Available literature is limited by area of coverage and breadth of the behavioral and biological data that was collected before, unknown population size and therefore unknown HIV counseling and testing, care, and treatment unmet need. This manuscript describes the behavioral and biological surveillance survey conducted among a sample of FSWs in Rwanda and aims to estimate the prevalence of HIV and assess risk factors for HIV infection in this sample.

Methods

Study setting and participants

This study consists of a cross-sectional integrated biological and behavioral survey of a sample of FSWs in Rwanda from 4 to 18 February 2010. The survey was conducted in all four provinces of Rwanda (North, East, South, and West) and the city of Kigali. Although the four provinces are primarily rural, FSWs were mostly located in the more densely populated towns and trading centers found in these provinces. The sampling plan was based on a modified version of Venue-Day-Time (VDT) sampling, also known as time–location sampling, which has been described as an appropriate sampling method for hidden populations, VDT was utilized to identify specific places and times where FSWs await their sex clients. Venues were defined as places where FSW solicited clients other than on the streets. For example, brothels, bars, and motels are venues. Street was defined as road, street, car park, and market. Both venue- and street-based sites were included in the survey. VDT is a method that involves specific venue, day, and time of availability of FSW waiting for their client.[15] For example, a hot spot could be open Friday to Sunday from 9:00 p.m. until 2:00 a.m. while another could be open Monday to Sunday from 6:00 p.m. to 10:00 p.m. The time frame was determined by the peak hours of the presence of FSWs at hot spots.

Venues were located based on information collected from the local community leaders and key FSW informants located in the same community. The number of FSWs at each site specifying the number of FSWs attending every VDT was roughly estimated by key informants located in the same community. The survey was conducted in 150 VDTs randomly selected among 694 VDTs with 10 or more FSWs per day, referred to as hotspots. One hotspot could be sampled more than once at different VDTs. In the Northern Province 15 sites were selected, 30 in the Southern province, 39 in the Eastern province, 15 in the city of Kigali, and 33 in the Western province. The number of participants recruited in each site was determined using probability proportional to size of each selected site.

Population and inclusion criteria

The study targeted self-reported FSWs aged 15 years or more who were found in a FSW hotspot area identified by a key informant and who self-identified as a sex worker. Exclusion criteria included age less than 15 years old, not self-identifying as a sex worker, and declining to consent to participate in the survey. For FSWs less than 18 years old, the waiver to participate in the survey was obtained from ethics committees because it was not possible

to identify and inform parents of these FSWs without introducing a selection bias, or stigmatizing the FSWs involved, or adversely having an effect on parental relationships.

Sampling process

A two-stage sampling technique was conducted using time–location sampling, referring to the specific time and place that a particular target population is present. The primary sampling unit was the time and place where FSWs were present at the hotspot, and the secondary sampling unit consisted of the FSWs in the selected time and place. The VDT sampling method was modified by taking a 'first come, first serve' sample of the FSWs in the selected time and place. With the 'first come, first serve' approach, all FSWs who were present at the site were asked to join the survey, and when the desired sample size at the site was reached, the recruitment was stopped. Assuming a 95% confidence level, a design effect of 2, and 80% power of detecting at least 15% precision around the point estimate, the calculated sample size was 1325 FSWs in total. There exist no previous national estimate of FSWs HIV prevalence in Rwanda; therefore, the proportion of FSW who used a condom during their last sexual relation, determined at the formative stage, was used as main indicator to estimate the sample size.

Data collection

Data were collected through an interview using a structured questionnaire by a trained data collector, a professional laboratory technician performed HIV testing and provided HIV results data. The data collection tools included questions related to sociodemographic characteristics, sexual behavior, condom use, STI symptoms, opinions and attitudes regarding HIV, alcohol consumption, and history of sexual violence. Condom use was determined by questions including frequency of condom use during last 30 days and condom use with paying sexual partners.

HIV testing and laboratory methods

HIV rapid diagnostic testing (using Unigold, Determine, and SD Bioline serial tests) per Rwandan national guidelines, at the time of interview, was conducted via a mobile voluntary counseling and testing unit for all survey participants. For those testing HIV-positive on RDT, dried-blood spot testing (Vironostika® HIV Uni-form II Ag/Ab, 4th Generation) was simultaneously conducted for QA testing by the National Reference Laboratory of the Ministry of Health of Rwanda. All survey participants testing positive on the rapid test were referred to a collaborating antiretroviral therapy center for HIV care and treatment. Individual pre- and post-test counseling was provided to all survey participants.

Ethical considerations

Interviewers provided information and obtained verbal consent from all participants for each of the questionnaire and laboratory phases; therefore, each participant could provide consent to participate in the survey only or both the questionnaire and laboratory sample. All interviews were conducted in private locations to ensure confidentiality. Data collectors were trained on data collection tools, ethical considerations, and confidentiality. A formal review and approval of the study and instruments were obtained from the National AIDS Control

Commission Research Committee, the National Institute of Statistic of Rwanda, the Rwanda National Ethics Committee, and the U.S. Centers for Disease Control and Prevention.

Data analysis

In order to minimize data recording errors, data were double entered, managed, and analyzed using Epi Info 3.5.1 (Centers for Disease Control and Prevention, Atlanta, GA, USA) and Stata v11 (STATA Corporation, College Station, TX, USA). Stata was used to fit statistical models. Means, proportions, and 95% confidence interval (CI) were computed for analyzed major variables (marital status, age group, level of education, religion, province, occupation, experience as FSW, recruitment based, experienced violence/ harassment, commercial sex partners in the last seven days, consistent condom use in the last 30 days, alcohol consumption in the last four weeks, had STI symptom in the last 12 months). HIV comprehensive knowledge was defined as knowing that proper use of a condom, having one faithful partner can protect against HIV/acquired immune deficiency syndrome (AIDS), recognizing that a person apparently in good health can transmit HIV/AIDS and at the same time rejecting the two most common misconceptions about HIV/AIDS transmission, that HIV can be transmitted by mosquito bites and HIV can be transmitted by sharing food. STI symptom was defined as reporting either a genital discharge or genital ulcer. Factors that were associated with HIV infection at a significant level of $p<0.1$, in bivariable analysis were included in a multivariable logistic regression model with HIV infection as the outcome. Adjusted odds ratios and 95% CI were estimated. Variables were retained in the final model if they achieved a $p<0.05$ significance.

Results

Overall, 1338 FSWs were enrolled in 150 VDT hotspots with an acceptance rate of 83% for laboratory testing. Almost all refusals to HIV testing (90%) were enrolled in Eastern Province. Of the 1338 women, 627 (46.9%) were 24 years of age or less, and 979 (73.2%) were single (Table 1). The proportion of married FSWs (3.7%) was very low in this population. Seventy-two percent had completed primary education or higher. Most (n = 797, 59.6%) had engaged in sex work for less than five years, 950 (71.0%) reported sex work as their only source of income, and 1067 (79.7%) obtained clients at the roadside or in other public places. Of the 1112 women who consented to laboratory testing, 565 were HIV-positive, representing 51.0% (95% CI: 47.9–53.8) of HIV prevalence. The city of Kigali had the highest HIV prevalence (56.2%), the lowest was found in the Eastern Province (32.5%) (Table 2).

In the bivariable analysis, age was associated with HIV prevalence, ranging from 42.1% (95% CI: 37.7–46.5) in the 15- to 24-year-old group to 57.7% (95% CI: 53.8–61.6) for those 25 years or older. HIV prevalence differed according to marital status, with the highest prevalence observed in FSWs that were separated, 58.7% (95% CI: 52.7–64.6), followed by single FSWs, 49.0% (95% CI: 45.5–52.4). The HIV prevalence differed with having more than five years of experience as a sex worker compared to those with less than five years, with a prevalence of 56.4% (95% CI: 51.0–61.7) and 48.1% (95% CI: 44.2–51.9),

respectively. HIV prevalence among street-based FSWs was (50.6% [95% CI: 36.0–50.6]) and 52.2% [95% CI: 44.9–59.6] among venue-based FSWs.

The HIV prevalence was higher among FSWs who reported using condoms consistently in the last 30 days compared to those who reported inconsistent use of a condom in the last 30 days (odds ratio [OR] = 1.29, 95% CI: 1.0–1.67). The effect of alcohol consumption in four weeks on HIV prevalence was not statistically significant (OR = 1.06, 5% CI: 0.92–1.22). Having comprehensive knowledge of HIV was associated with lower HIV prevalence (OR = 0.66, 95% CI: 0.49–0.89) and the presence of STIs symptoms was associated with higher HIV prevalence (OR = 1.80, 95% CI: 1.41–2.30).

In multivariable logistic regression, women 25 years old and older were associated with higher HIV prevalence than those less than 25 years old (aOR = 1.83, 95% CI: 1.42–2.37) (Table 2). Those who had experienced at least one STI symptom had a higher prevalence of HIV infection compared to those who had not (aOR = 1.74, 95% CI: 1.34–2.26). The effects of factors such as educational history, religious affiliation, occupation, experience of violence or harassment, and alcohol consumption in the last four weeks observed on HIV sero-positive status were found not to be statistically significant and were not retained in the final model. The HIV prevalence was higher among FSWs who reported using condoms consistently in the last 30 days preceding the survey compared to FSWs who did not (aOR = 1.39, 95% CI: 1.05–1.82). The HIV prevalence was lower among FSWs with comprehensive HIV knowledge (aOR = 0.65, 95% CI: 0.48–0.88) compared to those with no comprehensive HIV knowledge.

Discussion

Our findings demonstrated that HIV prevalence was 51% among a sample of FSWs, which is 17 times greater than the prevalence of the general population in Rwanda.[13] Other studies previously conducted among FSWs were mostly done in Kigali and found a lower HIV prevalence. There are noticeable differences between these studies and our study that include differences in settings, survey time periods, recruitment processes, and data collection methods.[18,19]

The high HIV prevalence among the sample of FSWs was consistent with studies from other developing countries, including India, Tanzania, and Senegal, which also found that FSWs had a high HIV prevalence compared to the general population.[20–22]

HIV prevalence was associated with older age, which is likely due to the greater cumulative number of sexual encounters than their younger counterpart and has been observed in previous FSW cohorts in East Africa.[23]

Consistent condom use in the 30 days preceding the survey was linked to a higher HIV prevalence. This may reflect reverse causality, where HIV-positive FSWs previously aware of their HIV-positive status, and possibly already linked to care had already received greater education and counseling services regarding prevention of HIV spread to commercial clients. This group may also have more easy access condoms due to regular access of HIV treatment services. This finding may suggest one possible success of HIV 'positive living'

campaigns. Future behavior surveillance survey among FSW should include more comprehensive data on HIV status, testing, treatment, and treatment outcomes.

FSWs with comprehensive HIV knowledge had a lower HIV prevalence compared to those who did not. That is, FSWs with greater awareness of HIV prevention methods and knowledge regarding transmission of HIV infection may have taken more appropriate measures to protect against HIV infection.[23,24]

STIs symptoms were associated with HIV infection. The relationship between STIs and HIV has been well established, most specifically with ulcerative STIs, which have been shown to be a frequent entry point of HIV virus.[17] HIV infection is also known to reduce the body's immunity to fight against STIs.[21,25]

This study has several limitations. Almost all participants were recruited from street-based locations; FSWs who work from venue-based locations were less likely to be enrolled in this survey. In this survey, we have seen that street-based FSWs demonstrated a higher HIV prevalence compared to venue-based FSWs though the observed difference was not statistically significant. Street-based FSWs were also more likely to be poor and homeless without any other source of income or basic education. Additional analyses should be conducted to better understand the differences between street- and venue-based FSWs to tailor HIV prevention programs for the different groups.

Additionally, 17% of the FSWs that took part in the survey refused to provide blood samples, which may have affected the HIV prevalence estimate. However, almost all refusals for HIV testing were recorded in Eastern Province, which has a lower overall HIV prevalence, and could therefore have resulted in slight overestimation of HIV prevalence among the sample of FSWs.

Behavioral and STI history were self-reported in this study and may have been prone to social desirability bias from participants. Despite these limitations, the results of this survey remain very informative and can be considered as guidance for prevention and treatment interventions and a baseline for subsequent surveys.

These results are not generalizable because of the nonrandom selection procedure that was used but can still be used to provide descriptive results for the sampled population. In addition, the statistical inference may not be valid because of the nonrandomness caused by the unknown selection bias induced from the '*first come, first served*' approach used to select FSWs for the study.

The national HIV plan for key populations including FSWs in Rwanda includes mobile services and outreach activities to reach these populations with nonstigmatizing services; a minimum package of services adapted to each key population, including peer education, HIV Counseling and Testing, condom distribution, STI prevention and treatment; improving the quantity and quality of peer educators reaching key populations; priority given to interventions targeting key populations, on the basis of mode of HIV transmission. Vulnerable girls and women who are part of the key population groups trained and supported to participate in HIV planning and coordination meetings at national and district level.

Currently, a combination of strategies to ensure that key populations have access to a comprehensive package of HIV services as defined by the national program include:

- Provision of facility-based services package including systematic initiation of treatment as prevention, regular screening and testing for STIs and HIV, condom provision, provision of family planning services;

- Provision of community-based services such as HIV counseling and testing, STIs screening, condom distribution through outreach strategies;

- Linkage of community and health facility level interventions to ensure continuum of care;

- Organize support group of different categories of key population through peer education approach;

- Organize mass campaigns targeting key population groups to increasing their awareness and service utilization.

Conclusion

This study demonstrates that HIV infection is highly prevalent among a sample of FSWs in Rwanda and could be a substantial mode of transmission of the HIV epidemic in Rwanda as it is in other Sub-Saharan African countries. Based on these results, it is important that HIV education and prevention be increased in this high-risk group using outreach programs, including programming recommendations that concentrate on reaching younger women prior to initiation of high-risk behaviors.

Combination prevention interventions, including outreach programs, test and treat programs, active referrals system, treatment adherence and retention support, STI identification and treatment, comprehensive HIV education, consistent and proper condom use will be vital for viral load suppression and reduced transmission among FSWs and their clients in Rwanda. Income-generating activities should be considered.

Routine behavioral and biological surveillance remain essential for key populations, and future surveys should assess the impact of programs aimed at reducing HIV incidence among FSWs.

Acknowledgments

References

1. Joint United Nations Programme on HIV/AIDS (UNAIDS). [accessed 15 October 2016] UNAIDS Guidance Note on HIV and Sex Work. 2012. UNAIDS/09.09E/JC1696E. Available at: http://www.unaids.org/sites/default/files/sub_landing/JC2306_UNAIDS-guidance-note-HIV-sex-work_en.pdf

2. World Health Organization (WHO). [accessed 15 October 2015] Prevention and treatment of HIV and other sexually transmitted infections for sex workers in low- and middle-income countries: recommendations for a public health approach. 2012. Available at: http://apps.who.int/iris/bitstream/10665/77745/1/9789241504744_eng.pdf

3. Ngugi EN, Roth E, Mastin T, et al. Female sex workers in Africa: epidemiology overview, data gaps, ways forward. SAHARA J. 2012; 9:148–153. [PubMed: 23237069]

4. Kerrigan, D., Wirtz, A., Baralet, S., et al. The global HIV epidemics among sex workers. Washington DC: World Bank; 2013. Available at: https://www.unfpa.org/sites/default/files/resource-pdf/GlobalHIVEpidemicsAmongSexWorkers.pdf [accessed 30 December 2016]

5. Pruss-Ustun A, Wolf J, Driscoll T, et al. HIV due to female sex work: regional and global estimates. PLoS One. 2013; 8:e63476. [PubMed: 23717432]

6. Papworth E, Ceesay N, An L. Epidemiology of HIV among female sex workers, their clients, men who have sex with men and people who inject drugs in West and Central Africa. J Int AIDS Soc. 2013; 16:18751. [PubMed: 24321113]

7. Ministry of Health, Uganda, and ICF International. Uganda Demographic and Health Survey 2012. Calverton, MD: ICF International; 2012.

8. Uganda Bureau of Statistics (UBOS) and ICF International Inc. Uganda Demographic and Health Survey 2011. Kampala, Uganda: UBOS and Calverton, Maryland: ICF International Inc; 2012.

9. Magnani R, Riono P, Saputro E, et al. Sexual risk behaviours, HIV and other sexually transmitted infections among female sex workers in Indonesia. Sex Transm Infect. 2010; 86:393, e399. [PubMed: 20522622]

10. Bautista CT, Sanchez JL, Montano SM, et al. Sero-prevalence of and risk factors for HIV-1 infection among female commercial sex workers in South America. Sex Transm Infect. 2006; 82:311–316. [PubMed: 16877581]

11. Patterson TL, Semple SJ, Staines H, et al. Prevalence and correlates of HIV infection among female sex workers in 2 Mexico–US Border Cities. JID. 2008; 197:728–732. [PubMed: 18260766]

12. Surratt HL, Inciardi JA. HIV risk, seropositivity and predictors of infection among homeless and non-homeless women sex workers in Miami, Florida, USA. AIDS Care. 2004; 5:594–604.

13. National Institute of Statistics of Rwanda (NISR) [Rwanda], Ministry of Health (MOH) [Rwanda], and ICF International. Rwanda Demographic and Health Survey 2010. Calverton, MD: NISR, MOH, and ICF International; 2011.

14. Braunstein SL, Ingabire CM, Geubbels E, et al. High burden of prevalent and recently acquired HIV among female sex workers and female HIV voluntary testing center clients in Kigali, Rwanda. PLoS One. 2011; 6:e24321. [PubMed: 21949704]

15. Decker MR, Crago AL, Chu SK, et al. Human rights violations against sex workers: burden and effect on HIV. Lancet. 2015; 385:186–199. [PubMed: 25059943]

16. Dhana A, Luchters S, Moore L, et al. Systematic review of facility-based sexual and reproductive health services for female sex workers in Africa. Global Health. 2014; 10:46. [PubMed: 24916010]

17. Asiimwe, A., Koleros, A., Chapman, J., et al. Understanding the dynamics of the HIV epidemic in Rwanda. Modeling the expected distribution of new HIV infections by exposure group. Kigali, Rwanda: National AIDS Control Commission of Rwanda and MEASURE Evaluation; 2009.

18. Braunstein SL, Ingabire CM, Kestelyn E, et al. High human immunodeficiency virus incidence in a cohort of Rwandan female sex workers. Sex Transm Dis. 2011; 5:385–394.

19. Baral S, Beyrer C, Muessig K, et al. Burden of HIV among female sex workers in low-income and middleincome countries: a systematic review and meta-analysis. Lancet Infect Dis. 2012; 12:538–549. [PubMed: 22424777]

20. Medhi GK, Mahanta J, Paranjape RS. Factors associated with HIV among female sex workers in a high HIV prevalent state of India. AIDS Care. 2012; 3:369–376.

21. Ministry of Health and Social Welfare of the United Republic of Tanzania. [accessed 30 December 2016] Report of HIV Behavioral and Biological Surveillance Survey Among Female Sex Workers in Dar es Salaam. 2011. Available at: http://ihi.eprints.org/2793/1/NACP_Report_on_the_HIV_FSW.pdf

22. Wang C, Hawes SE, Gaye A, et al. HIV prevalence, previous HIV testing, and condom use with clients and regular partners among Senegalese commercial sex workers. Sex Transm Infect. 2007; 83:534–540. [PubMed: 17942575]

23. Gregson S, Nyamukapa CA, Garnett GP, et al. Sexual mixing patterns and sex-differentials in teenage exposure to HIV infection in rural Zimbabwe. Lancet. 2002; 359:1896–1903. [PubMed: 12057552]

24. Banandur P, Rajaram SP, Mahagaonkar SB, et al. Heterogeneity of the HIV epidemic in the general population of Karnataka state, south India. BMC Public Health. 2011; 11:S13.

25. Vandenhoud HM, Langat L, Menten J, et al. Prevalence of HIV and other sexually transmitted infections among female sex workers in Kisumu, Western Kenya, 1997 and 2008. PLoS One. 2013; 8:e54953. [PubMed: 23372801]

Table 1

Sociodemographic characteristics of female sex workers in Rwanda, 2010, N = 1338.

Sociodemographic characteristics	n	%
Age group		
15–24 years	627	46.9
25 years	711	53.1
Marital status		
Single	979	73.2
Married/cohabitating	49	3.7
Separated	310	23.2
Education level		
None	376	28.1
Primary and beyond	962	71.9
Religion		
None	205	15.3
Christian	930	69.5
Muslim	172	12.9
Other	31	2.3
Province		
East	266	19.9
Kigali city	264	19.7
North	268	20.0
West	274	20.5
South	266	19.9
Occupation		
Sex work only	950	71.0
Sex work with additional occupation	388	29.0
Years of experience as FSW		
< = 5 years	797	59.6
> 5 years	388	30.2
Recruitment place		
Venue based	271	20.3
Street based	1067	79.7
Total	1338	100

FSW: female sex worker.

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Table 2

HIV prevalence among female sex workers by sociodemographic characteristics and its risks factors, Rwanda, 2010.

Variables	N	HIV %	95 % CI	Bivariable			Multivariable		
				OR	95% CI	p-value	aOR	95% CI	p-value
Overall	1112	51.0	47.8–53.8						
Demographic factors									
Marital status									
Single	807	49.0	45.5–52.4	1.0					
Married/cohabitating	39	35.9	20.1–51.7	0.6	0.3–1.1	0.115			
Separated	266	58.7	52.7–64.6	1.5	1.1–2.0	0.006			
Age group									
15–24 years	492	42.1	37.7–46.5	1.0			1.0		
25 years	620	57.7	53.8–61.6	1.9	1.5–2.4	0.000	1.8	1.4–2.4	0.000
Education									
None	321	51.1	45.6–56.6	1.0					
Primary and beyond	791	50.7	47.2–54.2	1.0	0.8–1.3	0.905			
Religion									
None	183	53.6	46.3–60.8	1.0					
Christian	749	51.4	47.8–55.0	0.9	0.7–1.3	0.602			
Muslim	154	44.8	36.9–52.7	0.7	0.5–1.1	0.11			
Others	26	50.0	29.4–70.6	0.9	0.4–2.0	0.734			
Province									
Kigali City	233	56.2	53.8–58.6	1.0					
Eastern	123	32.5	25.7–40.2	0.4	0.2–0.6	0.009			
Northern	260	46.9	43.6–50.3	0.7	0.5–1.0	0.034			
Western	251	54.6	48.7–60.3	0.9	0.7–1.3	0.062			
Southern	245	55.1	52.1–58.0	1.0	0.7–1.4	0.021			
FSW characteristics									
Occupation									
Sex work only	804	52.2	48.8–55.7	1.0					
Sex work with additional occupation	308	47.1	41.5–52.7	0.8	0.6–1.1	0.124			

Variables	N	HIV %	95 % CI	Bivariable			Multivariable		
				OR	95% CI	p-value	aOR	95% CI	p-value
Experience as FSW									
<5 years	647	48.1	44.2–51.9	1.0					
5 years	330	56.4	51.0–61.7	1.4	1.1–1.8	0.014			
Recruitment based									
Street based	923	50.6	47.4–53.8	1.0					
Venue based	180	52.2	44.9–59.6	1.1	0.8–1.5	0.69			
Risk factors									
Experienced violence/ harassment									
No	128	52.3	43.6–61.1	1.0					
Yes	905	51.2	47.9–54.4	1.0	0.8–1.2	0.07			
Commercial sex partners in the last seven days									
7 CS partners	735	51.4	47.8–55.1	1.0					
>7 CS partners	122	53.3	44.3–62.3	1.1	0.7–1.6	0.705			
Consistent condom use in the last 30 days									
No	748	49.1	45.5–52.7	1.0			1.0		
Yes	341	55.4	50.1–60.7	1.3	1.0–1.7	0.052	1.4	1.1–1.8	0.020
Was drunk in the last four weeks									
No	336	50.3	44.9–55.7	1.0					
Yes	406	53.2	48.3–58.1	1.1	0.9–1.2	0.07			
HIV comprehensive knowledge[a]									
No	808	53.1	49.6–56.5	1.0			1.0		
Yes	224	42.9	36.3–49.4	0.7	0.5–0.9	0.007	0.7	0.5–0.9	0.006
Had STI symptom in the last 12 months[b]									
No STI symptom	679	45.2	41.5–49.0	1.0	1.0				
At least one STI symptom	427	59.7	55.0–64.4	1.8	1.4–2.3	0.000	1.7	1.3–2.3	0.000

CI: confidence interval; CS: commercial sex; FSW: female sex worker; HIV: human immunodeficiency virus; OR: odds ratio; STI: sexually transmitted infection.

[a] HIV comprehensive knowledge was defined as knowing simultaneously that proper use of a condom, having one faithful partner can protect against HIV/AIDs, recognizing that a person apparently in good health can transmit HIV/AIDs and at the same time rejecting the two most common misconceptions about HIV/AIDs transmission.

[b] STI symptom was defined as genital discharge or genital ulcer.